Nutrients and Wastewater Facilities

Some Other State's Approaches

Department of Environmental Quality

WYOMING

Nutrient Work Group

March 11, 2014

Outline

- Background on Nutrients Treatment Technologies
- Region 8 State's Approaches
- Montana
- Colorado
- Utah
- Work Group Input for Wyoming

Nutrient Criteria and Treatment

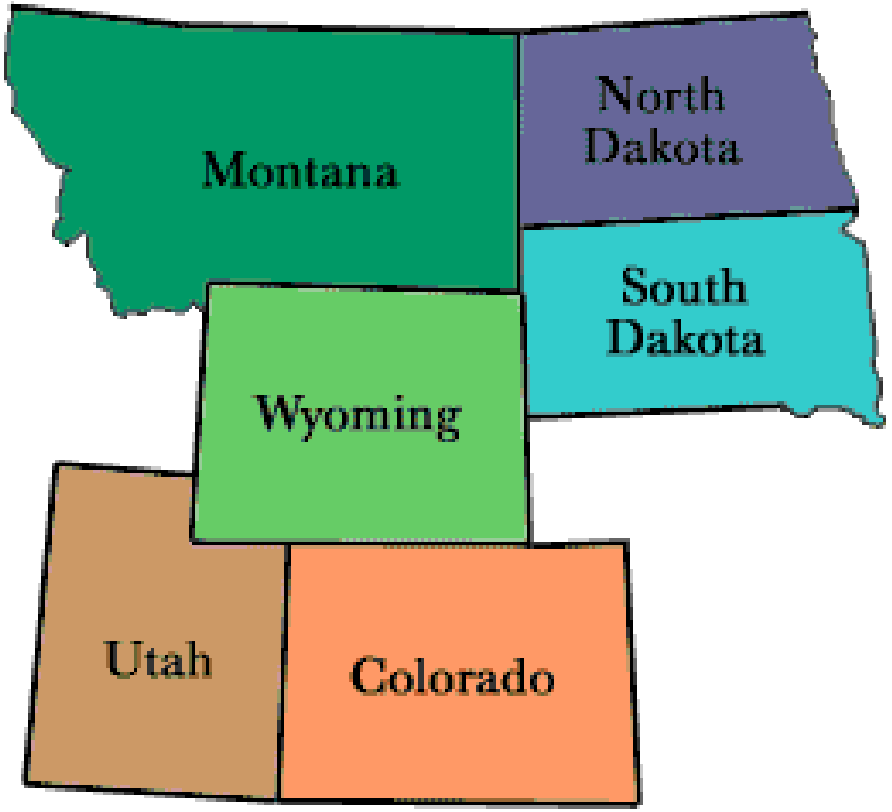
- Nutrient concentrations (total nitrogen, total phosphorus) to protect designated uses are generally very, very low
- If little or no stream dilution is available, dischargers will find it difficult or impossible to meet the standards

- In some case, standards may be below the limits of current treatment technology
- Upgrading facilities to meet criteria may be cost prohibitive

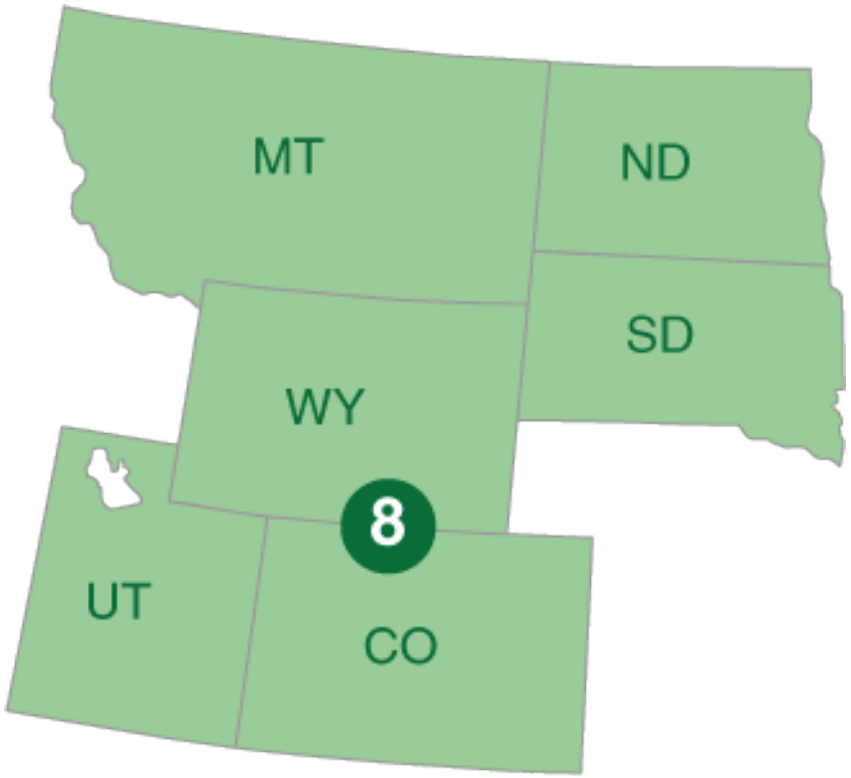
Nutrient Pollution and Treatment

- States have utilized different ways to modify effluent limits where meeting receiving water criteria would cause unreasonable economic burdens or where the standards are technologically infeasible

- States have also looked to impose effluent limits on dischargers to make near-term progress on nutrient reduction (nutrient reduction strategy)



Nutrient Pollution and Treatment



Montana: adopting statewide criteria, using general or individual variances for discharges (2014)

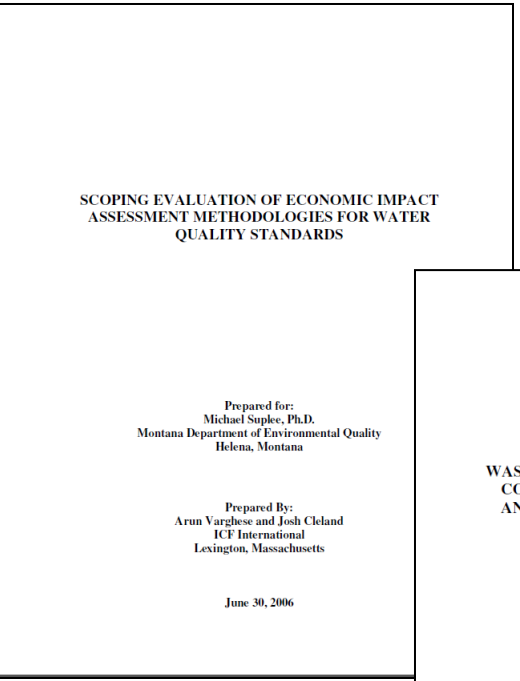
Colorado: adopted interim criteria, permitting regulations for numeric effluent limits (2012)

Utah: Nutrient Reduction Strategy, permitting regulations for effluent limits (2014 possibly)

North Dakota: Nutrient Reduction Strategy

Montana Variances

- Montana began developing numeric nutrient criteria in 2000
- Early results indicated the criteria were going to be very stringent and difficult for permit holders to meet



SCOPING EVALUATION OF ECONOMIC IMPACT ASSESSMENT METHODOLOGIES FOR WATER QUALITY STANDARDS

Prepared for:
Michael Suplee, Ph.D.
Montana Department of Environmental Quality
Helena, Montana

Prepared By:
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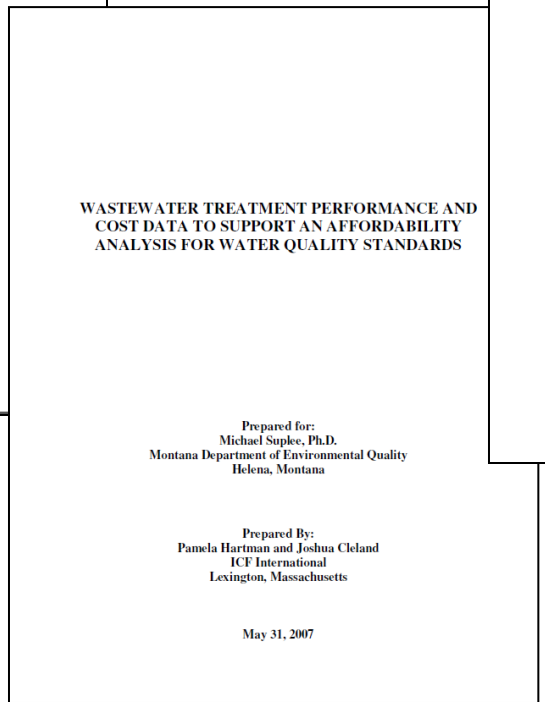
ICF International
Lexington, Massachusetts

June 30, 2006



WASTEWATER TREATMENT PERFORMANCE AND COST DATA TO SUPPORT AN AFFORDABILITY ANALYSIS FOR WATER QUALITY STANDARDS

Prepared for:
Michael Suplee, Ph.D.
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Prepared By:
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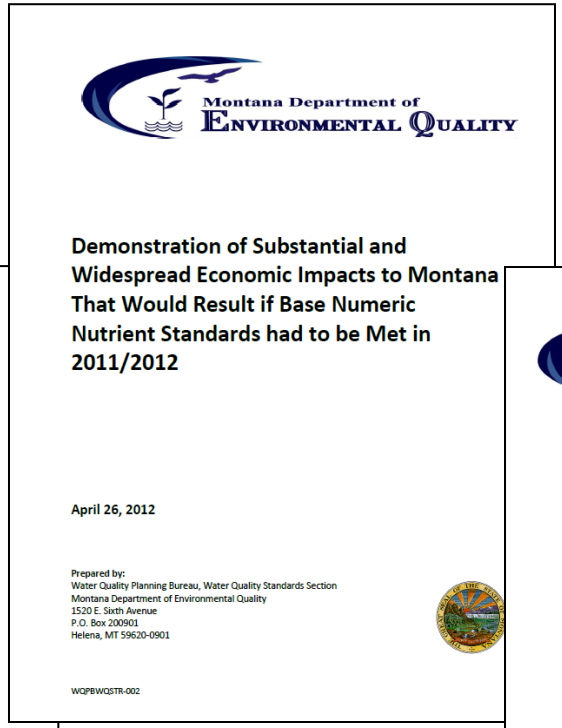
May 31, 2007



Montana Department of Environmental Quality

Demonstration of Substantial and Widespread Economic Impacts to Montana That Would Result if Base Numeric Nutrient Standards had to be Met in 2011/2012

April 26, 2012

Prepared by:
Water Quality Planning Bureau, Water Quality Standards Section
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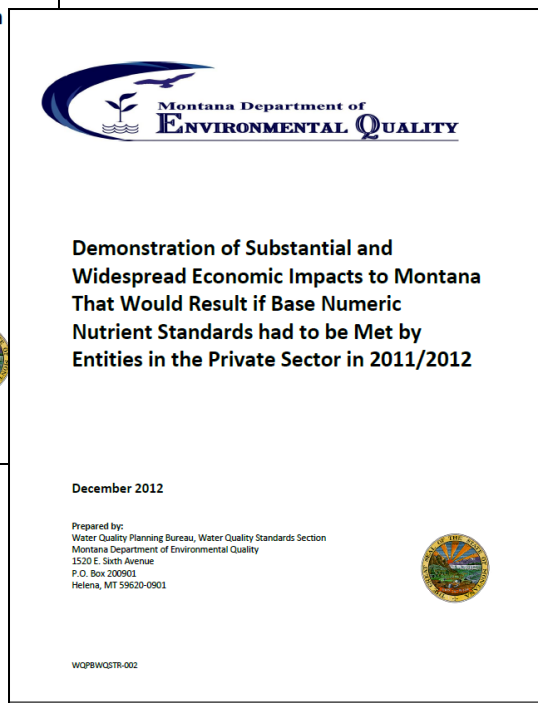
WQPBWQSTR-002



Montana Department of Environmental Quality

Demonstration of Substantial and Widespread Economic Impacts to Montana That Would Result if Base Numeric Nutrient Standards had to be Met by Entities in the Private Sector in 2011/2012

December 2012

Prepared by:
Water Quality Planning Bureau, Water Quality Standards Section
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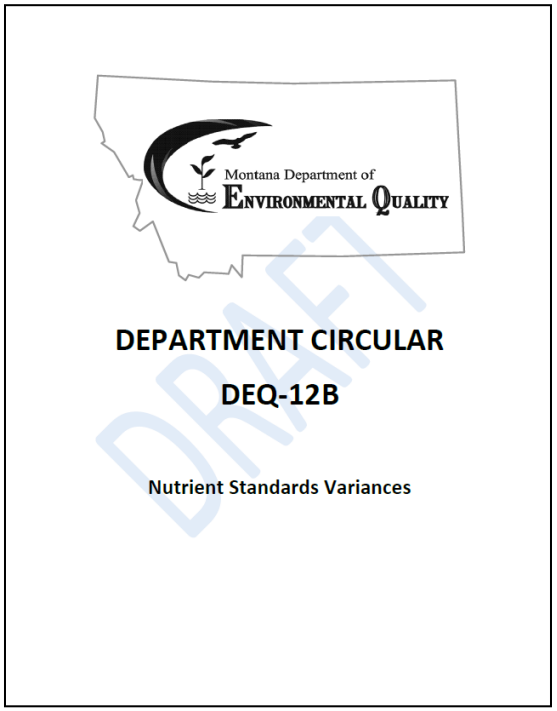
WQPBWQSTR-002

Montana Variances

- Recognizing the limits of technology and economic limitations for permittees, Montana's Legislature adopted laws to allow for variances to the water quality standards
- In 2009, Montana passed Senate Bill 95
- In 2011, Montana passed Senate Bill 367

Bills codified at 75-5-313

- Rulemaking currently underway for both numeric criteria and variance procedure
- Hearing March 24, 2014, Comment period ends April 1, 2014



Variances

- Variances are temporary modifications to a designated use and water quality criteria associated with the use
- Recognizes that in some circumstances it is not feasible for point source dischargers to meet water quality criteria
- Permit is written to a modified water quality standard in circumstances where it has been shown that the underlying standard is infeasible at the present time, but may be feasible in the future
- Generally, variances are based on demonstration that standards would cause “widespread economic and social impact”

Montana General Variances

- End-of-pipe treatment requirements for general nutrient standards variance (general variance)

	Monthly Average	
Discharger Category	Total Phosphorus (mg/L)	Total Nitrogen (mg/L)
≥ 1.0 Million gallons Per Day	1.0	10.0
< 1.0 Million Gallons Per Day	2.0	15.0
Lagoons Not Designed to Actively Remove Nutrients	Maintain current performance	Maintain current performance

- Discharger may apply for a general variance to total phosphorus, total nitrogen, or both
- May be established for a period not to exceed 20 years
- Compliance schedule may be granted to meet the treatment limits

Montana General Variances

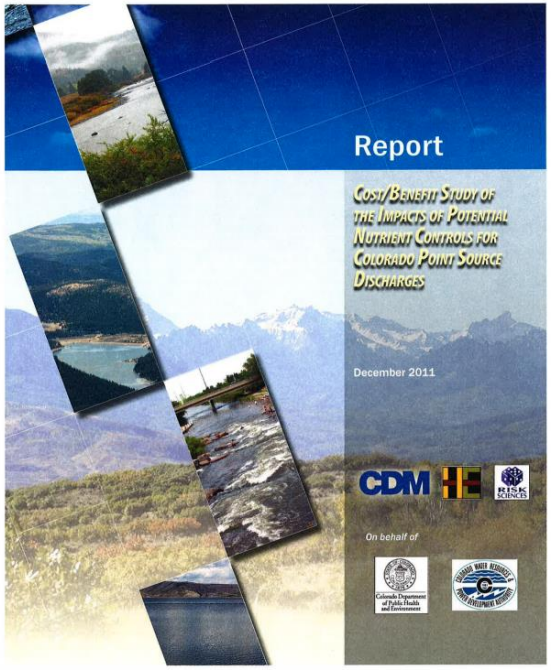
- Permittees receiving general variances are required to conduct a facility optimization study that includes:
  - Evaluation of current facility operations and maintenance to optimize nutrient reduction with existing infrastructure;
  - Analyze cost-effective methods of reducing nutrient loading such as nutrient trading
  - Evaluate reuse, recharge, and land application options

Montana Individual Variances

- Intended for permittees that would have financial difficulties meeting the general variance concentrations and are seeking individual nitrogen and phosphorus limits tailored to their specific economic situation
- Permittees can also demonstrate through water quality modeling and reach-specific data, that greater emphasis on reducing one nutrient will achieve similar in-stream results
- May be established for up to 20 years

Colorado Numeric Limitations

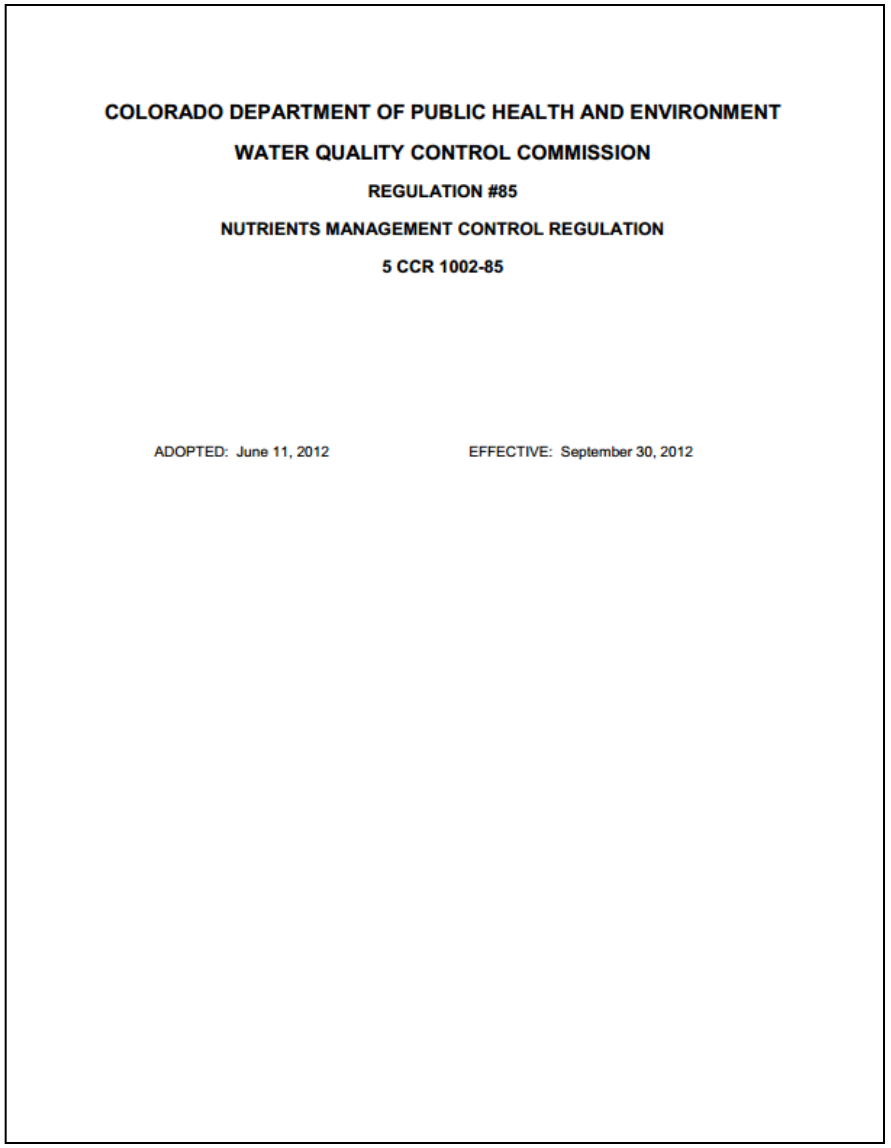
Colorado Department of Public Health and Environment



- Colorado adopted site-specific nutrient criteria for a few reservoirs in 1984, worked on numeric criteria for all waters during the 2000s
- June 11, 2012 amended Regulation 31, Standards (interim numeric nutrient criteria)
- At same time, passed Regulation #85, Nutrients Management Control Regulation
- Both became effective September 30, 2012
- Adoption was delayed until economic analysis could be completed

Colorado Numeric Limitations

- Established numeric limitations for dischargers
- Established monitoring requirements for dischargers
  - Total phosphorus
  - Nitrate+nitrite nitrogen
  - Total Kjeldahl nitrogen
  - Total nitrogen
- Voluntary steps for nonpoint sources



COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

WATER QUALITY CONTROL COMMISSION

REGULATION #85

NUTRIENTS MANAGEMENT CONTROL REGULATION

5 CCR 1002-85

ADOPTED: June 11, 2012 EFFECTIVE: September 30, 2012

Colorado Numeric Limitations

	Annual Median	
Discharger Category	Total Phosphorus (mg/L)	Total Inorganic Nitrogen (mg/L)
> 1.0 Million Gallons Per Day Discharging Prior to May 31, 2012	1.0	15.0
New Domestic Wastewater Facilities	0.7	7.0

- Regulation exempts:
  - Facilities with design capacity ≤ 1.0 million gallons per day
  - Facilities owned by disadvantaged communities (those with population ≤ 5,000 or median household income 80% or less of statewide median household income
- Regulation delays implementation of effluent limits until May 31, 2022 for:
  - Facilities with design capacity ≤ 2.0 million gallons per day
  - Facilities in low priority 8 digit hydrologic unit codes

Colorado Numeric Limitations

- Compliance schedules may be used to meet the effluent limits
  - Schedule requires specific steps needed to modify or install treatment facilities, operations, or other measures and deadlines for completion of those steps
- Exceptions can also be made where:
  - A permittee demonstrates that its discharge is unlikely to cause or contribute to an exceedance of the receiving water criteria
  - Effluent concentrations higher than the applicable effluent limits are adequate to achieve the receiving water criteria

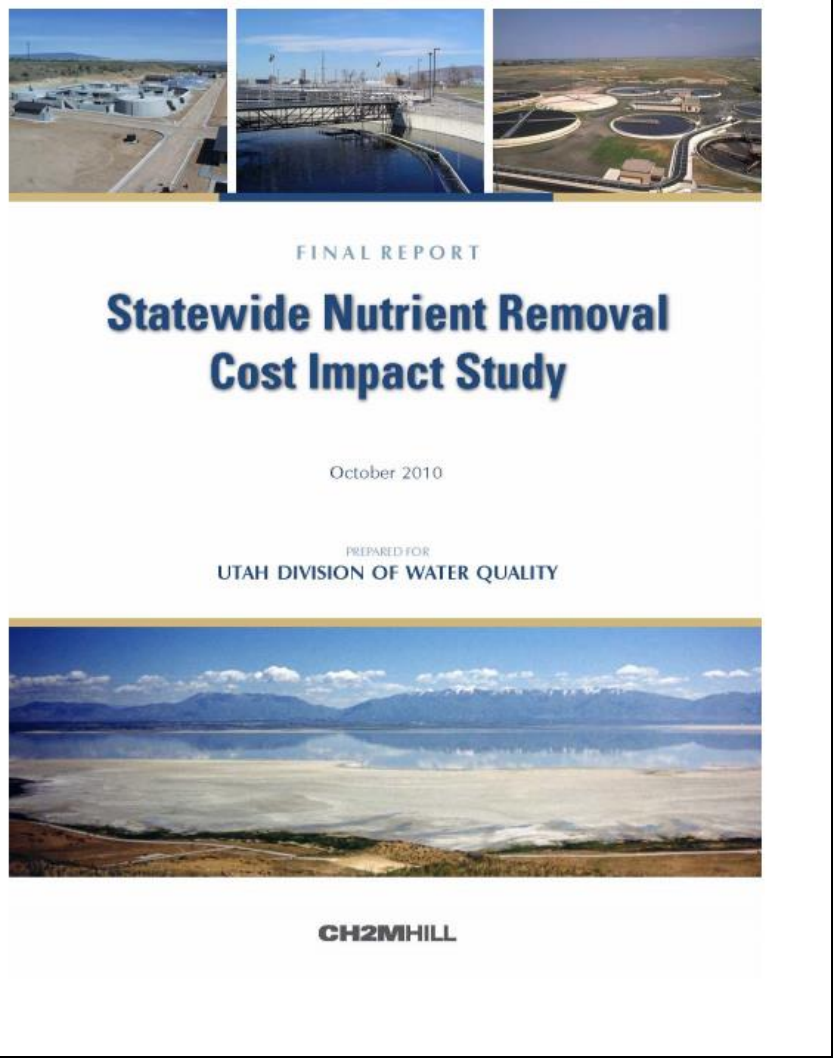
Colorado Numeric Limitations

- Variances from the effluent limits may be granted where:
  - Permittee demonstrates that meeting effluent limits do not bear a reasonable relationship to the economic, environmental, or energy impacts of meeting the limits
- Nutrient limits may be traded:
  - From point source to point source where the trade results in equal or better water quality for that parameter at all locations at all times (1:1 ratio)
  - From nonpoint source to point sources where Division has determined that trade achieves a net water quality or environmental benefit (2:1 ratio)

Utah Technology Based Standards

- In 2009, evaluated the economic impacts of potential new nutrient removal requirements for Utah's publicly owned treatment works (POTWs)
- Evaluated each POTW:
  - 30 mechanical plants
  - 1 large discharging lagoon
  - 0.55 mgd generic lagoon (~22)

Tier	TP (mg/L)	TN (mg/L)
1N	0.1	10
1	0.1	no limit
2N	1	20
2	1	no limit



Utah Technology Based Standards

- Utah working on numeric criteria; will take additional time
- As part of Nutrient Reduction Strategy, plan to implement technology based limits on POTWs
- Nutrient Strategy Technology Limits (2014 Draft Proposal)

	Annual Average	
Discharger Category	Total Phosphorus (mg/L)	Total Inorganice Nitrogen (mg/L)
Mechanical Plants	1.0	10.0
Lagoons	Cap load at design level or 125% of existing annual load	Cap load at design level or 125% of existing annual load

  - 0 Years: Implement Phosphorus
  - 3 Years: Justification for no P requirement or a plan to meet P
  - 5 Years: Comply with phosphorus; implement TIN limits
  - 7 Years: Justification for no TIN requirement or a plan to meet TIN
  - 10 Years: Comply with P and TIN

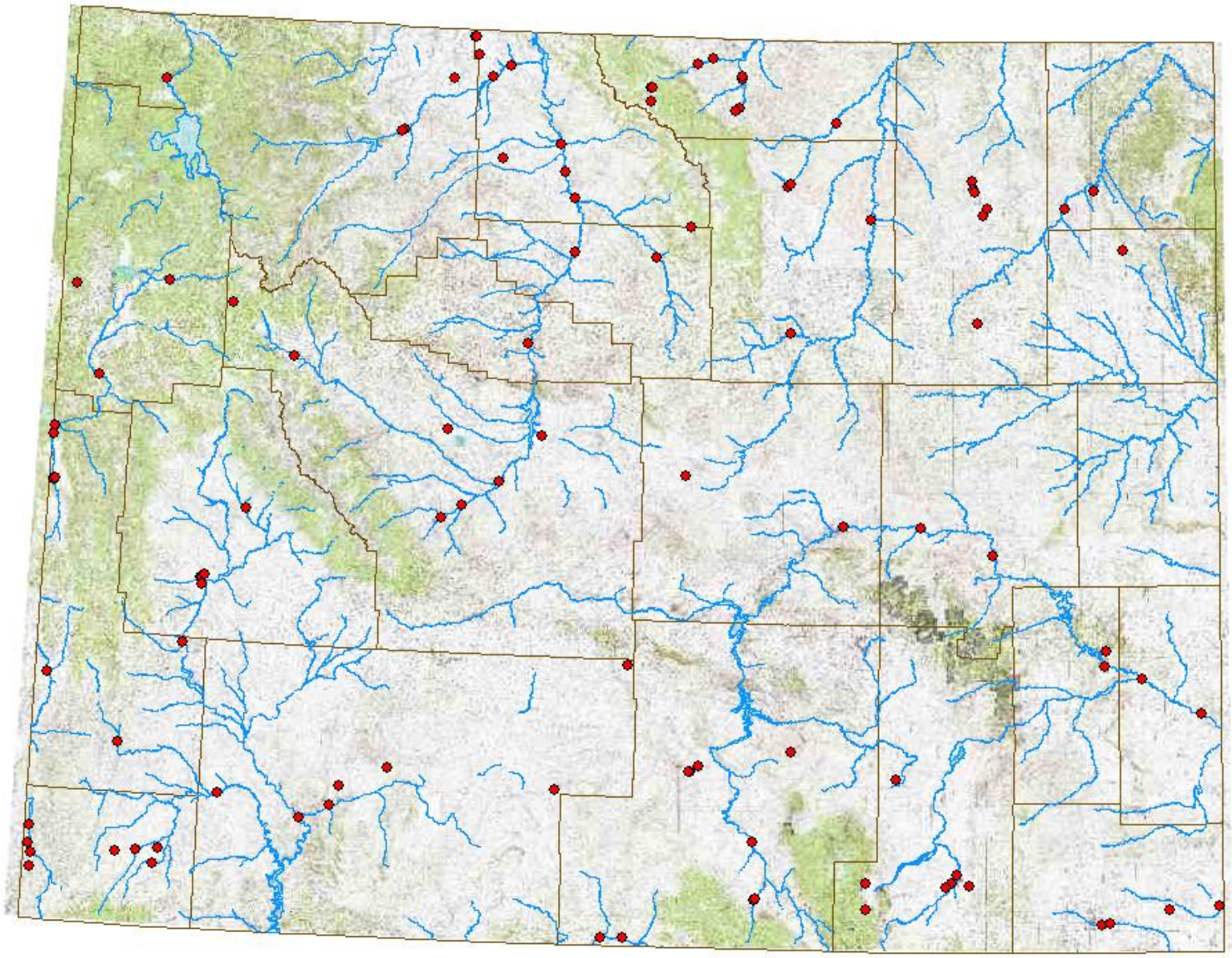
Utah Technology Based Standards

- Technology Based Limits are Not Required (Off Ramps):
  - For mechanical plants with *deminimus* effect on receiving water and associated watershed (waiver granted for one or both TP, TIN)
  - Where TMDL has allocated wasteload to plant, wasteload allocation takes precedence over technology based limits
  - Sufficient demonstration has been made that compliance with the technology based limits are not required for the watershed's continued good health and designated uses are met
  - When meeting limits would cause an economic hardship to the community (projected connection fees would be greater than 1.4% of the latest median adjusted gross household income)

Summary of Treatment Levels

State	TIN (mg/L)	TN (mg/L)	TP (mg/L)
Montana (Variances)		10	1
Colorado (Regulation #85)	15		1
Utah	10		1
Iowa		10	1
Pennsylvania	8 to 12		1 to 3
Minnesota (Watershed Specific)		10	1
Illinois (New and Expanded)			1
Ohio		Optimized	Optimized

Wyoming Facilities



~98 permitted

~18 non-lagoon

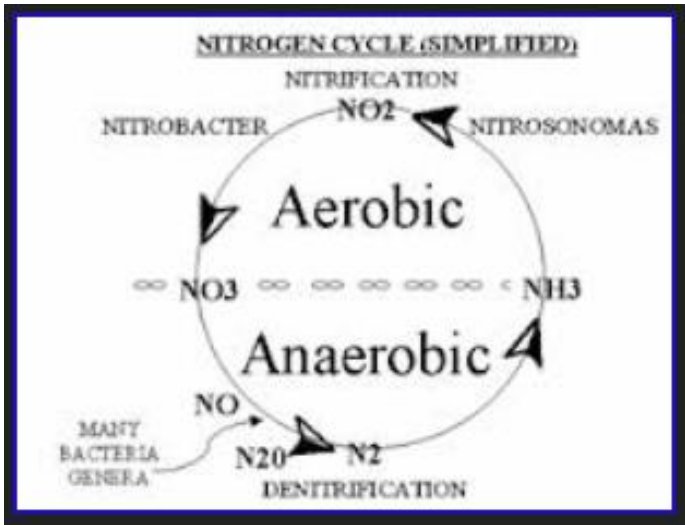
3 of 18 are Integrated lagoons

Ammonia has been primary nutrient of concern

Treatment Technologies

Nitrogen Removal

- Wyoming only regulates for Ammonia Removal at this time
- How can we treat nitrogen?
  - Nitrification – Denitrification Process
    - Add air to nitrify (Ammonia to Nitrates)
    - Remove air to denitrify (Nitrates to nitrogen gas)



Treatment Technologies

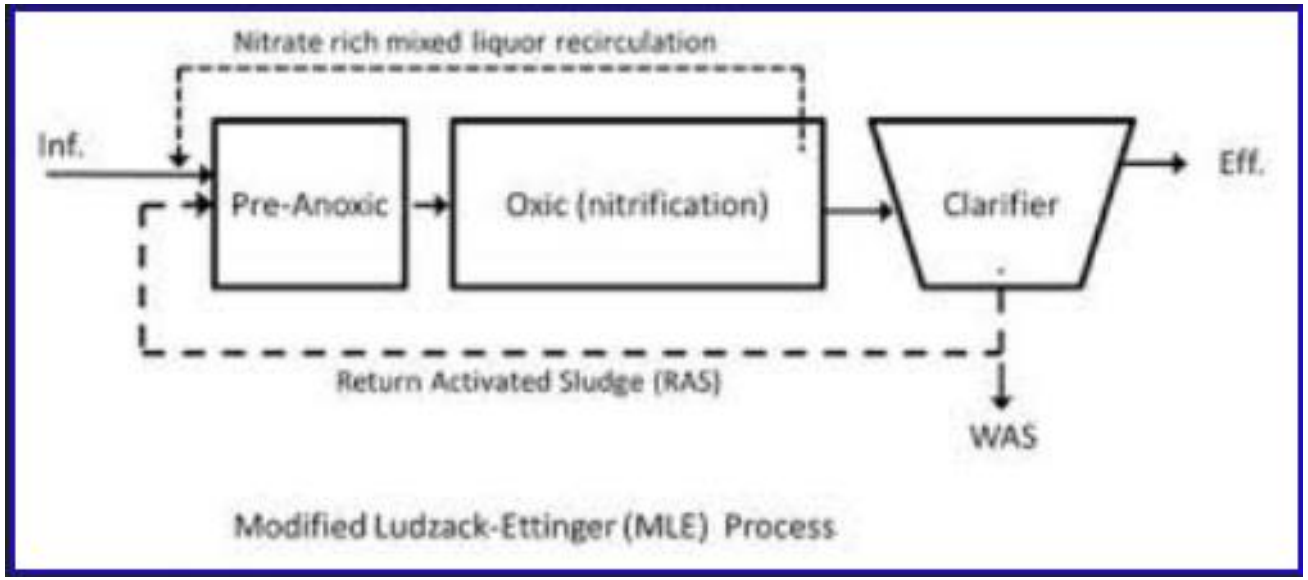
Nitrogen Treatment (Overview)

- Treat at beginning of plant (AIWPS)
- Treat in middle of plant (Poo-Gloos)
- Treat at the end of plant (SAGR)

Treatment Technologies

Nitrogen Treatment (Beginning of System)

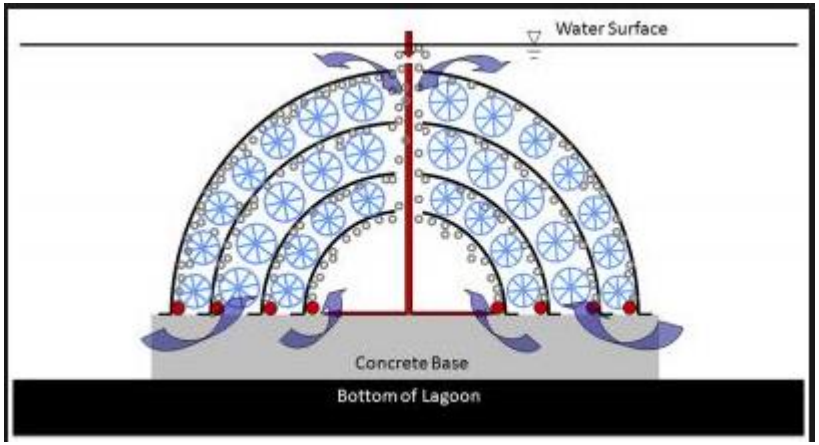
- Ludzack-Ettinger Process (Suspended Growth)
  - Advanced Integrated Wastewater Pond System
    - (Pinedale and Glenrock)



Treatment Technologies

Nitrogen Treatment (Middle of System)

- Poo-Gloos
  - Installations in Utah (not much in Wyoming)



Treatment Technologies

Nitrogen Treatment (End of System)

- Submerged Attached Growth Reactors (SAGR)
  - (Mountain View) (High Energy)

Treatment Technologies

Phosphorus Removal

- Wyoming does not have any plants treating for phosphorus
- How can we treat for Phosphorus?
  - Bind up in the Total Suspended Solids (TSS)
  - Remove the TSS, then you remove the phosphorus

Treatment Technologies

Phosphorus Removal

- Majority of Phosphorus already in TSS
- Problem is to remove the soluble phosphates.

- Soluble Phosphorus Removal
  - Chemical Addition (Coagulation)
  - Biological Process (Phosphate Accumulating Organisms – PAOs)

Treatment Technologies

Capital vs Operation Options

- Capital Improvements
  - Anoxic pre-cell construction
  - Poo-Gloos (Product Installation)
  - SAGRs
- Operational Optimization
  - The Water Planet (Grant Weaver) (ORP potentials)
  - Hach – Increased optimization measurements for nitrates

Work Group Input

- Nutrient reduction strategy or criteria/standards based approach? Both?
- How to address point sources for nutrient reduction strategy?
- Work on revising the Environmental Quality Act (35-11-601(o)) that doesn't allow variances to water quality standards ?
- Collect data from wastewater facilities about current discharge levels for total nitrogen, total inorganic nitrogen, and total phosphorus?
- Conduct a cost benefit analysis for wastewater facilities in the state to meet various technology based limits?
- Should we prioritize various sizes of facilities, waterbodies, etc. for effluent limits?
- Facility optimization?
- Trading?

Questions?

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